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INFORMATION ITEM

Lead Scientist's Report

Summary: This report includes five items: (1) a summary of an article from the *Canadian Journal of Fisheries and Aquatic Sciences* on the decline of wild Chinook salmon in the Sacramento–San Joaquin River system; (2) a summary of an article from *Hydrobiologia* on the effects of freshwater flow and phytoplankton biomass on copepod abundance and population dynamics; (3) a summary of the 2018 National Conference on Ecosystem Restoration; (4) an update on the Delta Science Joint Proposal Solicitation Notice; and (5) the By the Numbers Report.

Fishery Collapse, Recovery, and the Cryptic Decline of Wild Salmon on a major California River. Willmes, Malte; Hobbs, James A.; Sturrock, Anna M.; et al. *Canadian Journal of Fisheries and Aquatic Sciences*. published online January 2018.

Chinook salmon populations in the Central Valley are heavily supplemented by hatchery fish, which now dominate wild fish in several rivers. This supplementation can reduce genetic diversity and reproductive success of locally adapted wild Chinook salmon. Decreased genetic diversity leads to a diminished resiliency of populations to ocean and climate variability and increased vulnerability to collapse. This phenomenon likely contributed to the collapse and subsequent closure of the commercial ocean salmon fishery off the California and Oregon coasts in 2008 and 2009. Reliable estimates of hatchery and wild fish abundance in salmon populations (i.e., stock composition) are needed to monitor the species effectively and manage the fishery; however, current marking methods only provide estimates since 2010. Estimates of stock composition before and during the collapse of the salmon stock are necessary to identify past trends and assess population extinction risk.

Researchers from the University of California, Davis, and the Department of Water Resources determined the proportions of hatchery and wild adult salmon from 2002 to 2010 on the Feather River, a major tributary to the Sacramento River, by using otoliths to identify the salmon's origin. Otoliths are small bones found in the inner ears of bony fishes, and the bone's accretion of layers can be used to assess fish age and growth (much like the rings of a tree). With each layer, chemical elements from a fish's surrounding environment are also absorbed into the otolith, allowing scientists to determine where the fish was born (i.e., which hatchery or river), and whether it is from a hatchery or the wild.

The results of the study indicate that between 55 percent and 67 percent of adult salmon in the Feather River were from a hatchery before the salmon stock collapse in 2008 and 2009. This proportion increased to 89 percent in 2010 following the collapse. Outside data from the California Constant Fractional Marking Program show continued dominance of hatchery fish (approximately 90 percent) in 2011–2012. Altogether, these estimates exhibit a persistent decline of wild salmon in the Feather River during this time. Although the overall population rebounded, this was driven by the hatchery-origin fish population. To avoid future stock collapses, the authors recommend the wider adoption of hatchery practices that promote genetic diversity (e.g., varying timing and location of releases) and reduce interbreeding of hatchery and wild fish.

Effects of Freshwater Flow and Phytoplankton Biomass on Growth, Reproduction, and Spatial Subsidies of the Estuarine Copepod *Pseudodiaptomus forbesi*. Kimmerer, Wim J.; Ignoffo, Toni R.; Kayfetz, Karen R.; and Slaughter, Anne M. *Hydrobiologia*. February 2018.

Freshwater flow is a critical environmental factor in estuarine systems. It affects the distribution of salinity and aquatic organisms within the estuary and can influence productivity throughout the food web. It is important to understand how changes in freshwater flow impact physical processes and responses from organisms, such as the copepod (small crustacean) *Pseudodiaptomus forbesi (P. forbesi)*. Although *P. forbesi* is an introduced species in the San Francisco Estuary, it serves as important prey for Delta smelt and other fishes. As for most zooplankton in the estuary, little is known about how the population dynamics (i.e. population size, growth, death, and reproduction) of this copepod respond to variation in freshwater flow.

Researchers from San Francisco State University and the Delta Science Program studied the effects of freshwater flow on population dynamics of *P. forbesi* in the San Francisco Estuary, focusing on the Delta and Suisun Bay, and using a mix of field and laboratory experiments. A major finding of the study was that, during summer and autumn, the abundance of *P. forbesi* was highest in the freshwater regions of the study area and did not vary with changes in freshwater flow. In areas of low-salinity water, abundance increased with increasing freshwater flow. The authors propose that predation on *P. forbesi* by clams and predatory copepods in brackish water may lead to these differences. The authors conclude that the major way in which freshwater flow affects the *P. forbesi* population is by transporting the copepods from freshwater environments (where populations are larger and more reproductive due to the low number of predators) to low-salinity regions, where they become available to fishes. This study demonstrates the significance of freshwater flow to food webs in the estuary by influencing the spatial distribution of food supply.

2018 National Conference on Ecosystem Restoration Summary

The 7th National Conference on Ecosystem Restoration (NCER) was held in New Orleans, Louisiana from Aug. 26 to Aug. 30, 2018. The conference brought together more than 400 restoration professionals from across 39 states and five countries, including five staff members from the Delta Stewardship Council. The Conference featured a day-long series of plenary panel discussions focused on ecosystem restoration in the Gulf of Mexico. The plenary panels were inspired by the Science Enterprise Workshop, which was coordinated by the Delta Stewardship Council and the United States Geological Survey in 2016 and brought together over 200 experts for three days of intensive discussion focused on management, communication, and funding of science in support of decision-making.

Delta Science Program staff participated in many facets of the Conference. Darcy Austin was a member of the NCER Planning committee and coordinated a session focusing on Sacramento Delta restoration, featuring staff from multiple Delta agencies. She also presented on behalf of Lauren Hastings, providing an overview of adaptive management for California EcoRestore. In separate sessions, Maggie Christman discussed approaches to synthesis and communication to inform decision making in the Bay-Delta, and Edmund Yu described the Delta Independent Science Board's role in providing oversight of activities that support adaptive management, as well as the use of peer review by the Delta Science Program. John Callaway participated in one of the four plenary panels, evaluating large-scale effects of habitat restoration, and he also presented on behalf of Rainer Hoenicke about lessons for establishing flow goals in the Delta. Information from this conference will help inform current initiatives, such as the update to the ecosystem chapter of the Delta Plan, and the further development of adaptive management in

the Delta. Presentations at NCER were recorded and will be posted at http://conference.ifas.ufl.edu/ncer2018/index.html.

Delta Science Joint Proposal Solicitation Notice Update
On Sept. 10, 2018 the Delta Science Program (DSP) and the California Department of Fish and Wildlife (CDFW) released a joint proposal solicitation notice (PSN) to fund scientific studies in the Delta. The PSN is the first joint/multi-agency notice with a focus on Delta science and will fund up to $12 million of scientific research. Providing support for Delta research is a key element of the DSP's mission, and the research will inform a broad range of Delta agencies in furthering the coequal goals. The focus of the solicitation includes knowledge gaps identified in the 2017-2021 Science Action Agenda, the objectives of Proposition 1, and the missions of the agencies. Collaborative proposals among different groups and disciplines are encouraged. A draft of the PSN was made available on Aug. 10, 2018, and CDFW and DSP held a successful online webinar on Aug. 21, 2018 to review the draft PSN and accept public comments.

Important dates:

- Final Proposal Solicitation Notice (PSN) release: Sept. 10, 2018
- Application Workshop: Sept. 20, 2018 (3:00 p.m. – 5:00 p.m.) and Oct. 17, 2018 (2:00 p.m. – 4:00 p.m.)
- Deadline for proposals: Oct. 26, 2018 (4:00 p.m.)
- Funding announcements: Mar.-Apr. 2019

Solicitation focus areas:

- Habitat restoration support and evaluation
- Interactions between stressors, managed species, and communities
- Habitat requirements of Delta estuarine and migratory aquatic species
- Human dimensions of natural resource management
- Science synthesis
- Monitoring, data management, and modeling

Contact WatershedGrants@Wildlife.ca.gov with any questions or comments.

Links:
Delta Science Program website
http://deltacouncil.ca.gov/delta-science-proposal-solicitation

CDFW's website
https://wildlife.ca.gov/grants

Online Webinar from Aug. 21, 2018 (recording and PowerPoint available)
http://deltacouncil.ca.gov/events/draft-delta-science-proposal-solicitation-notice-public-webinar

Science Action Agenda
http://scienceactionagenda.deltacouncil.ca.gov/

By the Numbers

Delta Science Program staff will give a summary of current numbers related to Delta water and environmental management. The summary (Attachment 1) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

List of Attachments

Attachment 1: By the Numbers Summary (report to be provided at the Council Meeting)

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